→ Orin R.

United States Government

Department of Energy

memorandum

Albuquerque Operations Office

DATE: NOV 05 1997

REPLY TO ATTN OF: OSHD

SUBJ: Secretarial Directive, August 4, 1997, DOE Response to the May 14, 1997 Explosion at Hanford's Plutonium Reclamation Facility

TO: Victor Reis, Assistant Secretary for Defense Programs, DP-1, HQ/FORS
Peter Brush, Acting Assistant Secretary for Environment Safety and Health, EH-1, HQ/FORS

The attached site reports are for your information and use in responding to the subject Secretarial directive. In response to the portion of the subject directive requesting a reassessment (within 120 days of the directive) of known vulnerabilities (chemical and radiological) at facilities that have been shut down, are in standby, are being deactivated, or have otherwise changed their conventional mode of operation in the last several years, the DOE/AL, requested that each site manager reassess their facilities and operations. The attached site reports contain the information obtained.

In summary, the information provided by the AL sites (LANL, SNL, WIPP, Pantex Plant, Kansas City Plant, Grand Junction) reflects that proactive efforts are in place to identify chemical and radiological (where applicable) vulnerabilities. Existing vulnerabilities are being addressed, and to date, the site reports do not reflect identification of new vulnerabilities. This review resulted in some process improvements for some sites. SNL has not completed their total review which is expected by mid-December 1997 and will be included in the end of year report. The information contained in the reports reflect well-characterized waste streams and site reviews did not identify any unknown waste storage tanks. A summary matrix of the information submitted is being provided to assist your review. The site reports contain information that will appear in the end-of-year report. AL sites will evaluate their facilities and operations for new vulnerabilities on a continuing basis.

Please contact Alex Griego (505-845-5681) or Kim Delman (505-845-5096), should you have questions relative to the information contained in the attached report.

R E Glass

Bruce G. Twining
for Manager

Attachment

cc:
See page 2

cc w/attachment:
M. Krebs, ER-1, HQ/FORS
A. Alm, EM-1, HQ/FORS
T. Lash, NE-1, HQ/FORS

cc w/o attachment:
G. Ives, DP-20, HQ/FORS
R. Staffin, DP-10, HQ/FORS
K. Murphy, EH-52, HQ/GTN
L. Lee, DP-45, HQ/GTN
W. Goodrum, AAO
G. Dials, CAO
D. Gurule, KCAO
M. Zamorski, KAO
G. Todd, LAAO
J. Tillman, GJO

AL SITES SUMMARY MATRIX
CHEM/RAD VULNERABILITIES/WASTE TANKS

AL Sites	Requirement: Reassess known Vulnerabilities (Chem/Rad)	Requirement: Chem/Rad Waste Storage Tank Assessment
AAO/PTX	No unrecognized or previously unanalyzed hazards; the facility continues to operate and is not in standby or shutdown mode.	Waste streams are well characterized and accounted for.
CAO/WIPP	Does not have any facilities that are in the standby, deactivated, shutdown mode and no chemical or radiological vulnerabilities.	Does not have chemical or radioactive waste storage tanks.
KAO/SNL	To date, no new chemical or radiological vulnerabilities have been found at active or inactive sites. The review is continuing.	Has not identified any unknown or uncharacterized hazards waste storage tanks.
KCAO/KCP/KO	There are presently no materials that have been identified as sufficiently hazardous and used in large enough quantities to create an emergency level event.	There is no legacy waste and bulk storage tanks for hazardous waste is no longer used.
LAAO/LANL	No new chemical or radiological vulnerabilities were identified. Existing vulnerabilities are being adequately addressed.	Waste tanks have been fully characterized.
GJO/MONTICELLO	Monticello is an ongoing remediation project; full-time safety staff support for identifying vulnerabilities on a continuing basis. No facilities are in shutdown, in standby, deactivated or otherwise changed.	No waste storage tanks.
GJO/GRAND JUNCTION	No buildings have been shutdown or placed in standby; buildings scheduled for deactivation have had all chemicals redistributed or placed in appropriate storage. Routine building inspections have provided continuing evaluation for vulnerabilities and one have been noted.	No waste storage tanks.

United States Government | Department of Energy

memorandum

Albuquerque Operations Office
Amarillo Area Office

DATE: NOV 26 1997

REPLY TO ATTN OF: AAO:EPM:AJC

SUBJECT: DOE/AL Response to the May 14, 1997 Explosion at Hanfords's Plutonium Reclamation Facility

TO: K. L. Delman, OSH, Albuquerque Operations Office

Ref: a) Memorandum OSHD:KLD (97003) dated Aug 14, 1997 on DOE/AL Response to the May 14, 1997 Explosion at Hanfords's Plutonium Reclamation Facility
b) Memorandum OSHD dated Sept 22, 1997 on DOE/AL Response to the May 14, 1997 Explosion at Hanfords's Plutonium Reclamation Facility
c) Memorandum OSHD:KLD dated Nov 07, 1997 on Secretarial Memorandum on the Assessment of Hazards Associated with Chemical and Radioactive Waste Storage Tanks and Ancillary Equipment

As requested by the memo's sited above, the Amarillo Area Office and Mason & Hanger Corporation have reviewed the procedures, various databases, and conducted a plant wide physical inventory of all chemicals in storage, in process and/or in the waste stream. The attached report is provided in response to above references, but specifically, no major changes are needed in the Pantex Plant as this review revealed that no excess, unused or unneeded chemicals on site that pose a significant risk for explosion, fire, or toxic release to the environment, or that cause a significant change in the vulnerability of this site to an accident of those types.

In Reference (a), it was requested that the Area Office assess the Technical competency of the Area Office personnel who would be expected to recognize issues concerning hazardous material along with Facility Design and Controls, safety documentation and authorization basis, hazardous material composition and proper waste handling and disposal. The Amarillo Area Training Office reviewed Safety and Health Staff, Risk Management, Facility Representatives, Emergency Program and Waste Operation personnel. They were all found to be in the Technical Qualification Program and trained in their respective areas.

This report completes all outstanding actions referenced above. If you have any questions or need additional clarification, please contact me at 806 477-6671.

A. J. Cerrone
Emergency Program Manager

cc w/o attachments:
D.Burke, EMD, MHC
A.J. Dionizo, OPS, MHC
C. Cantwell, ES&H, MHC
D. Watkins, ES&H, MHC
D. Kelly, AAO
D. White, AAO
B. Mullen, AAO
P. Higgins, OMD, AL
~~G. Runkle, OSH&D, AL~~
G. Carroll, OMD, AL
File No 97-298

since 1827
MASON & HANGER CORPORATION

NOV 1 3 1997

Mr. W.S. Goodrum
Area Manager
USDOE
Amarillo Area Office
Amarillo, Texas

Re: Pantex Plant Response to Issues Raised following the Hanford Plutonium Reclamation Facility Explosion

Dear Mr. Goodrum:

The attached report is provided in response to the following DOE memoranda:

1) AAO:AAMNMO:JRK, dated August 26, 1997, entitled "DOE/AL Response to the Hanford Plutonium Reclamation Facility Explosion," and

2) AAO:BMS:AJC, dated October 2, 1997, entitled "DOE/AL Response to the Hanford Plutonium Reclamation Facility Explosion."

The first reference requested a report addressing the initiatives identified by December 1, 1997. The second reference requested that the response be moved up to November 14, 1997. The attached report fulfills the November 14, 1997, requirement.

If you have any questions or need additional information regarding this report, please contact R.S. Watkins at (806)477-5559.

Very truly yours,

jn W.A. Weinreich
General Manager

WAW:ej
Attachment: As stated

GM97-04958-780

971111.1

Pantex Plant, Amarillo Texas
Report on Initiatives
from the
May 14, 1997 Explosion at Hanford's Plutonium Reclamation Facility

General

A review of the Pantex Plant chemical inventory has been completed. This review was precipitated by the initiatives cited in Secretary of Energy Federico Peña's memorandum of August 4, 1997, "*DOE Response to the May 14, 1997, Explosion at Hanford's Plutonium Reclamation Facility.*" According to the guidance provided by the HQ DOE PRF Response Coordinating Group, the contractor is only responsible for two of the four initiatives; scrutinizing the chemical inventories and assessment of the staff technical competence.

In general, this review revealed that there are no excess, unused or unneeded chemicals on site that pose a significant risk for explosion, fire, or toxic release to the environment, or that cause a significant change in the vulnerability of this site to an accident of those types.

Hazardous Chemicals

On October 30, 1997, Pantex Plant conducted a plant-wide physical inventory of all chemicals in use, in storage, in process and/or in a waste stream. The final result of that inventory is still being examined; however, the initial review revealed that there are no previously unidentified hazards or potential accident situations for this site. Unlike the process at Hanford that had been shut down for over four years and slowly evolved into the catastrophic situation of the 14th of May, there are no containment vessels, storage tanks or abandoned processes at this site that may result in a hazardous or emergency situation. This inventory revealed a deficiency in the way we account for items that are consumed in process, depleted, recycled or wasted as a course of their use, in that, the empty containers are being disposed of without being removed from the main Plant-wide database for tracking chemical issues. As a result, the database showed considerably more material on hand than was actually here. At the outset of the inventory, the database showed approximately 126,250 items in inventory. Once completed, the actual inventory contains only just in excess of 50,000 items. Steps are being taken to fix the problem by requiring end-users to report the item barcode numbers to a central office for processing once the empty container is disposed of, and we are proposing the addition of automated barcode scanners to the empty container accumulation sites across the Plant to simplify and positively capture the process of disposal.

The inventory also showed that there are several established waste streams for items currently leaving the Plant, and that the wastes therein are well characterized and accounted for. A small amount of additional waste was identified as a part of the chemical inventory process, but not a significant increase over what was already known.

Staff Technical Competence

The technical competence for recognition and remediation of hazards by the staff at Pantex Plant has been reviewed and verified on a number of occasions. There have been no problems identified. Within the Environment Safety & Health Division we have the following numbers of degreed and nationally certified professionals:

> Out of 201 persons employed in the ES&H Division, 11 have Doctorate degrees (5.5%); 51 have Masters degrees (25%); 56 have Bachelors degrees (28%); 27 have Associate degrees (13%); and 56 have a High School Diploma (28%) as their highest held degree.
>
> There are a total of 91 nationally recognized professional credentials held in such fields as, National Registry of Radiation Protection Technologists (17), Associate Environmental Professional (10), Occupational Health and Safety Technologist (8), Certified Safety Professional (7), Professional Engineer (7), Certified Industrial Hygienist (5), Certified Health Physicist (5), and Certified Hazardous Materials Manager (5).

Additionally, the technical competence of the Line Management and Production Technician personnel has been established under DOE Order 5480.20a and rigorously examined through local technical qualification programs (Qual Cards), USQ issues, DNFSB reviews, SARs, JHSAs, and the Readiness Review process. A knowledge of the hazards associated with the chemicals in the operations and processes in their areas are an integral part of these reviews. Training programs are available to provide workers with additional assistance as needed.

Conclusions

Pantex Plant does not have any unrecognized or previously unanalyzed hazards that have been brought to the fore by this review. By virtue of the fact that this facility continues to operate and is not in standby or shutdown mode, there are very few, if any, hazards that are not dealt with on a continuing basis. Excess, unneeded or unused hazardous chemicals that have been identified as a part of this process will be expeditiously disposed of in the safest and most environmentally responsible manner. The technical competence of the staff, from the floor-level technician to the responsible manager, and including the support professionals, is well established. No additional training is required.

DOE F 1325.8

United States Government | Department of Energy

memorandum

Carlsbad Area Office
Carlsbad, New Mexico 88221

DATE: DEC 0 1 1997

REPLY TO ATTN OF: CAO:AT:LBL 97-1574 (UFC 1300.00)

SUBJECT: Responses to Secretarial Memos

TO: Alex Griego, AL

As you are aware, the Waste Isolation Pilot Plant is a new facility, we have never had radioactive material on site to store or create a hazard.

In response to the August 4, 1997 memo bullet #2, chemical and radiological vulnerabilities, the Waste Isolation Pilot Plant (WIPP) does not currently have any facilities that are in the standby, deactivated, shutdown mode or that would otherwise meet the criteria. The mode of operation at the WIPP is active and there has been no changes in the mode of operation over the past seven years.

In response to the October 21, 1997 memo concerning chemical and radioactive waste storage tanks, the WIPP does not have any chemical or radioactive waste storage tanks.

If you have any questions, please call me at (505) 234-8138.

George E. Dials
Manager

United States Government | Department of Energy

memorandum

Albuquerque Operations Office
Kirtland Area Office

DATE: December 2, 1997

REPLY TO: KAO:AAMLO/RJS

SUBJECT: Secretarial Directive, August 4, 1997 - DOE Response to Explosion at Hanford Plutonium Reclamation Facility- Chemical Vulnerability Assessment

TO: Gene Runkle, Director, OSHD/AL

As part of the response to the Secretary's directive of August 4, 1997, DOE/KAO requested that Sandia National Laboratory reassess vulnerability to hazardous materials incidents. SNL has committed to a thorough evaluation of both active and inactive sites. DOE/KAO has requested a complete, comprehensive report of all issues in the Secretary's directives, including emergency management, lessons learned, waste storage tanks, technical competencies, and hazardous materials vulnerabilities prior to December 10, 1997.

Prior to this December 10 comprehensive report, SNL has communicated to KAO that, to date, no new chemical or radiological vulnerabilities have been found at active or inactive sites. In a review of SNL for waste storage tanks, SNL has not identified any unknown or uncharacterized hazardous waste storage tanks. Hazardous materials are currently inventoried and controlled. The processes by which SNL inventories and controls hazardous materials will be detailed in the comprehensive report.

SNL continues to work on the comprehensive report and to address any issues raised by the reviews required by the Secretary. If you have any questions, please contact me.

Ronald J. Simonton
Operations Advisor
Laboratory Operations

cc:
A. Griego, OSHD/AL
K. Delman, OSHD/AL
L. Kirkman, OTMO/AL

United States Government | Department of Energy

memorandum

Albuquerque Operations Office
Kansas City Area Office
Kansas City, Missouri 64141-0202

DATE: NOV 26 1997

REPLY TO ATTN OF: OTM:Caughey(816) 997-3449:

SUBJECT: **DOE/AL Response to the May 14, 1997 Explosion at Hanford's Plutonium Reclamation Facility**

TO: Larry D. Kirkman, Deputy Assistant Manager, Office of Technical Management and Operations,

Attached is a consolidated response to your September 22, 1997, memorandum and the November 7, 1997, memorandum from Gene Runkle titled: Secretarial Memorandum on the Assessment of Hazards Associated with Chemical and Radioactive Waste Storage Tanks and Ancillary Equipment. This response has been reviewed, validated and concurred on by the Kansas City Area Office (KCAO) and applies to both Kansas City Plant and Kirtland Operations facilities. This report should provide the information you need to prepare both the progress report and the 120-day report requested by Secretary Peña's May 14, 1997, memorandum. Although the Hanford explosion incident has caused us to reexamine our emergency planning and reporting processes as well as the nature of our facility operations, we have found no vulnerabilities that were not previously identified.

Please do not hesitate to contact David Caughey (816-997-3449), of my staff, if you need any further assistance.

David A. Gurulé
Area Manager

cc: w/attachment
G.E. Runkle, AL/OSHD
K.L. Delman, AL/OSHD
P.T. Hoopes, KCAO/OTMO
C.C. Gentile, AlliedSignal D/010, OD27

- Hazardous Chemicals: The listings contained in the Occupational Safety and Health Administration's Standards *"Process safety management of highly hazardous chemicals"* (29 CFR 1910.119) and the Environmental Protection Agency's *"Chemical Accident Prevention Provisions"* (40 CFR 68) are the regulated hazardous chemicals and quantities thresholds.
- Radiological Material: FM&T is a non-nuclear radiological facility. The FM&T inventory will not meet or exceed threshold quantities of radionuclides for higher hazard class categories 2 and 3. Table A.1 of the DOE-STD-1027-92, *"Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Report"*, lists the threshold quantities by radionuclide.

Unused or excess hazardous materials are reviewed for potential re-use or re-sale. During the circularization process the materials are retained in Chemical Stores to ensure safe storage. Hazardous waste generated at the KCP and KO is stored, managed, and shipped in accordance with existing state and federal regulations and existing permits. Storage lots are inspected on a weekly basis to ensure that safety and environmental regulations are met. The KCP and KO have no Legacy Waste and no longer use bulk storage tanks for hazardous waste.

These requirements and conditions are verified annually through internal and external assessments including:

- Annual ES&H Inspections
- Annual Explosives Safety inspections/audits
- Det Norske Veritas (DNV) International Safety Rating System Appraisal
- International Organization for Standardization (ISO) 14001 Environmental Management System Standard evaluation of environmental aspects
- DOE Voluntary Protection Program (VPP) Annual Assessment
- Fire Protection Department inspections and annual preplanning self-assessments
- KCAO Quarterly ES&H Facility Reviews
- Ongoing KCAO Operations Representative observations and surveillances.

2. *DOE field offices must reassess known vulnerabilities (chemical and radiological) at facilities that have been shutdown, are in standby, are being deactivated, or have otherwise changed their conventional mode of operation in the last several years, and report status to their Program Secretarial Officers and the Assistant Secretary for Environment, Safety and Health within 120 days. Facility operators must evaluate their facilities and operations for new vulnerabilities on a continuing basis.*

In support of the Stockpile Management Restructuring Initiative (SMRI), the KCP is in the process of reducing it's footprint (square footage) by vacating areas of the plant and returning facility space to the General Services Administration (GSA). Production activities necessary to support SMRI and the DOE mission are being consolidated

within the existing facility. No facilities or operations are being decommissioned or deactivated.

Those areas (floor space) identified as return candidates have been reviewed for known chemical vulnerabilities. Documented operating histories indicate that no process upsets resulting in reportable spills have occurred. Those areas to be returned to GSA will be sampled for lead chromate and methylene chloride containing paint as well as solvents used for paint booth cleaning. Abandoned space will be freeze protected; excess equipment will be removed; and safety barriers installed for vacated foundations or pits.

New processes or changes in processes that may introduce new chemicals or change the inventories of chemicals at the KCP and KO are reviewed by ES&H personnel in accordance with the Preliminary Hazard Analysis (PHA) program, to ensure that ES&H Thresholds are not exceeded and that hazardous materials are effectively managed.

FM&T maintains and annually updates a Hazard Assessment for the KCP and a Hazard Survey for KO. Included in these documents is an examination of the amounts and hazardous properties of chemicals. Chemicals are examined during storage, transport, and use. Worst case credible events are computer modeled to identify the potential danger level presented by these chemicals. There are presently no materials that have been identified as sufficiently hazardous and used in large enough quantities to reach an Emergency Response Planning Guideline (ERPG) 2 level offsite. Based on the Hazard Assessment or Survey, worst case credible chemical events do not create an emergency level event as defined by DOE. Changes to hazardous material inventories or usage identified through the PHA program are communicated to the Emergency Management organization throughout the year.

3. *DOE and contractor field organizations with operational responsibilities must assess the technical competence of their staffs to recognize the full range of hazards presented by the materials in their facilities, act on results, and implement training programs where needed.*

Hourly and salaried associate training and qualification requirements are systematically identified and defined within the FM&T Qualification and Training program. By classification, this system establishes qualification, mandatory, and development training requirements for each FM&T associate. Associate qualifications and training are reviewed annually. Also, third-party assessments have validated the training and qualification system, including: the DOE Voluntary Protection Program, the Det Norske Veritas International Safety Rating System, the ISO 9001 Quality Management System and the ISO 14001 Environmental Management System certification reviews.

KCAO Assistant Area Managers assess the qualifications and technical competence of DOE personnel on an annual basis through the creation of Individual Development Plans (IDPs) that identify known deficiencies, establish short and long range goals, and establish training objectives. The KCAO Operations Representatives also have an established qualification program that is based on the requirements contained in the Albuquerque Operations Office Facility Representative Manual. These requirements have been to adapted to correspond to the nonnuclear nature of KCP and KO operations and to the technologies and hazards present at both sites. ES&H and other technical personnel are additionally encouraged to obtain and do possess nationally recognized registrations and certifications in their respective fields.

4. *DOE field offices must assess their site Lessons Learned and Occurrence Reporting programs to assure that 1) outgoing information is well characterized and properly summarized, and 2) incoming information is thoroughly evaluated, properly disseminated, appropriately implemented, and tracked through formal management systems.*

Each occurrence report generated at the KCP or KO is reviewed and approved by both the FM&T Facility Manager and KCAO Operations Representative to ensure accuracy. Occurrence report writing guidelines have been established to use in the report review process. Occurrence Reports are not released in the Occurrence Reporting and Processing System (ORPS) until the review and approval is complete. Training is provided to Facility Managers and KCAO Operations Representatives to ensure compliance with the Occurrence Reporting Plan.

Occurrence reports, emergency management drills and exercises, accident investigations, Operating Experience Weekly Summary, and daily operations and event reports are reviewed for lessons learned information. Corrective actions for lessons learned from emergency management drills and exercises, and accident investigations are distributed to appropriate FM&T and KCAO personnel and documented in an FM&T internal database. Safety Alerts and lessons learned from occurrence reports applicable to operations at FM&T are published in an electronic bulletin board available to all FM&T and KCAO personnel. Lessons learned information is also communicated using printed and internal television media at both the KCP and KO. Formal reporting of preventive actions taken is transmitted from FM&T back through KCAO to ensure closure occurs.

Memo for Record:

United States Government

memorandum

Department of Energy
Albuquerque Operations Office
Los Alamos Area Office
Los Alamos, New Mexico 87544

DATE: 24 Nov 1997
REPLY TO ATTN OF: LAAMFO
SUBJECT: Review of Facilities in Deactivated, Decommissioned or Stand-down Status For Chemical and Radiological Hazards

Alex Greigo, DOE-AL/EMD

CONCURRENCES
RTG SYMBOL
NAME
DATE

We completed a review of facilities in deactivated, decommissioned or stand-down status for Chemical and Radiological Hazards as requested the Secretary Pena letter. The review included an analysis of existing databases, reviews of LANL facility status reports and walkdown evaluations with LANL ESH personnel. The review was consistent with the guidelines contained in his 4 Aug 1997. Our methodology for the screening process and evaluation is included with the report attached.

Summary. Our review identified one facilities that requires continued effort to correct deficiencies, the Chemistry Metallurgy Research (CMR) Laboratory. This facility is currently undergoing joint rigorous technical safety reviews and operational safety reviews by LANL and DOE-LAAO. LANL is revising and improving their Automated Chemical Information System (ACIS) and their Health Hazard Assessment (HHA) program to provide improvements in tracking and management of chemical materials.

If there are any questions concerning this report, please contact me at 7-0580 or Dave Barber at 7-3818. The LANL Team Lead on this was Jeffrey Schinkel, ESH-5, 7-7801.

Rudy J. Valdez, DOE
LAAMFO, Safety & Health Team Leader

1 Attached

Assessment of Chemical & Radiological Vulnerabilities in Facilities at Los Alamos National Laboratory, Nov 1997.

OFFICIAL FILE COPY

U.S. Department of Energy
Los Alamos Area Office
And
LANL Environment, Safety, and Health
Coordinated Report

Assessment of Chemical & Radiological Vulnerabilities in Facilities at Los Alamos National Laboratory

November 1997

1.0 INTRODUCTION

This assessment is in response to the 4 August 1997 memorandum from Department of Energy Secretary Peña that outlined DOE initiatives in response to the explosion at Hanford's plutonium reclamation facility. Subsequent to the Secretary's memorandum, DOE/AL Occupational Safety and Health Division (OSHD) issued the following three memoranda:

Date	Subject	Directive(s)
14 August 1997	DOE/AL Response to the May 14, 1997 Explosion at Hanford's Plutonium Reclamation Facility	• A report addressing the identified initiatives [in the Secretary's memorandum] for your site ... by 12 Dec. 1997.
22 September 1997	DOE/AL Response to the May 14, 1997 Explosion at Hanford's Plutonium Reclamation Facility	• An assessment of known vulnerabilities ... no later than 26 November 1997. • A progress report ... on implementation of the initiatives contained [in the Secretary's] memorandum. {A reminder about the 14 August 1997 memorandum deadline.}
7 November 1997	Secretarial Memorandum on the Assessment of Hazards Associated with Chemical and Radioactive Waste Storage Tanks and Ancillary Equipment	• All waste storage tanks be identified, fully characterized, and addressed in the November [assessment] status report.

The assessment that follows is the result of coordinated efforts by the DOE Los Alamos Area Office (DOE/LAAO) and the Los Alamos National Laboratory (LANL).

This document describes the review and analysis process for evaluation of known chemical and radiological vulnerabilities at facilities that have been shutdown, are in standby, are being deactivated, or are in stand-down mode at Los Alamos National Laboratory. It also describes the review of the chemical inventory. The evaluation process is divided into three distinct parts in this report: Chemical Safety Vulnerability Report Status, Controls, and Walkdown Evaluations.

ABBREVIATIONS

D&D Decontamination and decommissioning
TA [LANL] Technical Area

2.0 CHEMICAL SAFETY VULNERABILITY REPORT STATUS

Two generic vulnerabilities were identified as requiring action during preparation of the comprehensive site response plan in 1996: Condition of Facilities and Safety Systems, and Inventory Control and Tracking.

2.1 Condition of Facilities and Safety Systems

Surveillance and maintenance activities are continuing for facilities and systems coming under this vulnerability. Activity data sheets have been submitted, but the priority scores have remained below the funding line.

2.2 Inventory Control and Tracking

Three activities were planned with respect to the LANL Automated Chemical Inventory System (ACIS). The proposed activities are shown in italicized text, with the status shown in regular text.

- *Review other chemical management systems for ideas that can be adapted or adopted into ACIS. In particular, evaluate newer generation software that can provide a graphical user interface to ACIS and involve users in new screen designs and functions.*
  A review team has been assembled with representatives from ESH Division, Business Operations (BUS) Division, Computing, Information, and Communications Division, DOE/LAAO, and users such as Engineering Sciences & Applications Division, Materials Science and Technology (MST) Division, Chemical Science and Technology Division (including CMR), and Johnson Controls, Inc. (the local support services subcontractor). Chemical tracking database systems from Pacific Northwest National Laboratory and American Management Systems, Inc. have been identified. Review is ongoing for these and other systems. ACIS will remain largely unchanged in the short-term (six months to one year). Identified enhancements will be planned and phased into the ACIS process to minimize disruptions.

- *Pursue modification of the chemical procurement system so that chemical information screens precede procurement screens to ensure that future changes in procurement procedures do not break data links with ACIS.*
  All chemicals in the Just-in-Time purchase catalogs have been identified and flagged. These flags will allow the LANL BUS Division to present chemical purchasers with supplemental ordering screens to collect ACIS-specific information at the time of the order. (It should be noted that missing information has been routinely identified and captured during chemical receiving activities.)

- *Form a team from ESH and BUS divisions to review Gas Plant operations related to gas cylinder tracking.*
  The Gas Plant ACIS process has been extensively revised and newly implemented. Now all Gas Plant products are received into ACIS. The LANL Industrial Hygiene and Safety Group is conducting monthly quality assurance on the Gas Plant ACIS records.

3.0 CONTROLS

3.1 Engineering Controls — Ventilation Systems

Recently, Los Alamos National Laboratory learned of a calibration error in its performance testing procedure for local exhaust ventilation systems. All air velocity measuring instruments had been routinely calibrated to standard conditions (760 mm Hg [29.92 inches Hg], 21 °C [70 °F]), whereas LANL is located at an altitude of 7,400 feet. At this elevation, the corresponding atmospheric pressure is about 585 mm Hg. The result was that the measured air velocities were below the actual values. For a more complete background and description of requirements, please refer to the attached "Notice" (Attachment 1).

In addition to the requirements contained in the Notice, LANL took the action to notify Facility Managers by email. The performance testing procedure has been revised and reissued, and the document is available on the LANL Intranet. Instruments are still calibrated to standard conditions, but the measurements are corrected to the actual values. (The calibration to actual conditions at LANL exceeds the adjustment span available to the user. The instrument manufacturers have refused to modify the instruments to allow a greater span.) It should be noted that the performance testing procedures have always called for evaluation of higher velocity systems by an industrial hygienist.

3.2 Administrative Controls

ACIS VS. OSHA PROCESS SAFETY MANAGEMENT CHEMICAL QUANTITIES

LANL is revising and improving ACIS to provide an increased rigor of chemical safety surveillance and inventory control (see Section 2.2). As part of this assessment, ACIS data were matched against the OSHA Process Safety Management Appendix A list of chemicals and threshold quantities. Initially, the query produced 1,367 records matched on Chemical Abstracts Service registry number. This number fell to five (5) when the summed ACIS quantities were compared with the threshold quantities. Further analysis showed no chemicals in use or storage at LANL that exceed a threshold quantity, based upon knowledge of returned chemicals and knowledge of actual chemical use conditions or concentrations.

Earlier this year, LANL replaced the use of chlorine at its wastewater treatment plant (TA-46, building 340) with the MIOX technology. The one-ton chlorine cylinders that had caused to process to come under the Process Safety Management standard have been removed from the LANL site. Chlorine, in 150 pound cylinders, is still used for water chlorination. Previous assessments have shown the use to be below the threshold quantity, and that all associated activities are performed by trained employees using proper equipment (including personal protective equipment).

HEALTH HAZARD ASSESSMENT PROGRAM

The LANL Health Hazard Assessment (HHA) program baseline was completed on 31 October 1997 for active operations. Chemical hazards are rated on a 0 (low) to 4 (high) hazard scale. The

ratings take into account the controls, concentrations, quantities, duration, and frequency of use. There are no chemical processes or operations having a value of 3 or 4.

CAPITAL ASSETS MANAGEMENT PROGRAM (CAMP)

CAMP is a comprehensive facilities management plan that ensures that deactivated building or those awaiting decontamination and decommissioning are routinely evaluated to prevent unauthorized entry, or improper storage or degradation of storage conditions. The facility management portion of the FY98 CAMP Report was reviewed as part of this evaluation.

4.0 WALKDOWN EVALUATIONS

4.1 FACILITY INVENTORY

Knowledge of facilities and the CAMP Report for FY98 were used to identify the list of facilities reviewed during the assessment. The annual CAMP report contains a listing of facilities that are decommissioned or deactivated and plans for decommissioning of facilities. This was coordinated with LANL for concurrence and accuracy.

The following tables summarize the facilities that were evaluated.

TABLE 4.1
Decommissioned Facilities

FACILITY	HAZARD TYPE	STATUS
TA-16, munitions bunkers	Rad	D&D complete
TA-21, several buildings	Rad/Chem	D&D complete/ in progress
TA-33, Bldg. 86 (HPTL)	Rad	EM-30
TA-35, Phase Separator Pit	Chem	D&D complete

TABLE 4.2
Facilities in Stand-down or Storage

FACILITY	HAZARD TYPE	STATUS
TA-3, Bldg. 29 (CMR)	Rad/Chem	In restart (see later paragraphs)
TA-3, Bldg. 16 (IBF)	Rad	Closed and locked.
TA-16, Bldg. 370	Chem	Closed and locked. Behind security fence.

4.2 Walkdown Goals

Walkdown evaluations were conducted to confirm the facility conditions and status listed in the CAMP report. Each walkdown was coordinated with the DOE Facility Representative for the respective facility. The facilities were screened using risk-based criteria based on:

- Existing controls

- Chemical products stored
- Radiological hazards
- Public access

Buildings were surveyed for chemical or radiological storage, containment, and controls. ACIS was utilized to provide a listing of chemical materials present in the facilities. The inventory was cross-checked during the walkdown evaluations to confirm the types and amounts of chemicals actually present. In the event that a chemical was identified on the inventory but not identified in the laboratories, we spoke with the Facility Manager. Radiological materials, such as stock material, check-sources, contaminated materials, and contamination (in-place), were also reviewed.

4.3 Walkdown Results

The following table summaries the results:

TABLE 4.3
Confirmatory Walkdown Summary

FACILITY	HAZARD TYPE	STATUS
TA-3, Bldg. 16 (IBF)	Rad/Chem	Decommissioned. Tritium contamination (targets). Storage area in basement. Building locked.
TA-3, Bldg. 29 (CMR)	Rad/Chem	See paragraph below on CMR.
TA-6, Bldgs. TM-1 through TM-9	Rad/Chem[1]	No materials in facility. Small amounts of asbestos containing materials (ACM) were present.
TA-8, Bldgs. 1, 2, 3	Rad/Chem	No materials in facility. HE contamination in drains.
TA-15, Bldg. 23	Chem	Stand-down. No chemicals.
TA-16, Bldgs. 7 & 10	Chem	No materials in facility.
TA-16, Bldg. 27	Chem	Building being torn down now.
TA-16, Bldg. 58	Chem	Contaminated HE line removed.
TA-16, Bldgs. 90, 91, 92	Chem	Buildings removed.
TA-16, Bldg. 101	Chem	Building removed.
TA-16, Bldg. 370	Chem	Oxygen and nitrogen cylinders in place on loading dock. Machines in place.
TA-16, Bldgs. 515, 516, 517	Chem	No materials in facility.
TA-21, Bldg. 150	Rad/Chem	Compressed gas cylinders properly secured outside of facility. Building locked.

Note: 1. Chemical refers to High Explosive work buildings.

CHEMISTRY AND METALLURGY RESEARCH (CMR) BUILDING

The CMR building is addressed separately because it had been in a stand-down, and it is now partially operational. CMR was shutdown on 2 September 1997 to allow workers to ensure

safety of operations at the facility. The sixty activities performed in CMR fall under six categories: facilities, analytical chemistry, chemistry research and development, and those activities performed by Nuclear Materials Technology (NMT) Division, Nonproliferation and International Security (NIS) Division, and Materials Research and Processing Science (MST-5). The restart schedule and plan calls for six of those activities related to materials control and accountability to undergo corrective actions and resume normal operations by the end of October. The remaining 54 activities are scheduled to undergo the necessary corrective actions and resume normal operations between mid-November and the end of January 1998. Activity owners have to create a resumption package for each activity. Each package must include a detailed work-authorization and work-control system and be reviewed by the line manager for completeness.

The conclusion of this assessment is that the chemical and radiological vulnerability issues at CMR are receiving a high level of scrutiny and rigor. These issues are being adequately addressed by the CMR Resumption Management Team and DOE/LAAO, the Technical Safety Requirements Group, and the LANL Upgrade Team.

A specific chemical, perfluoroisobutylene (PFIB), was retained in the inventory and analysis process because we were informed it would be used in future operations at the CMR building. The assessment concluded that there was no immediate concern, and that if CMR maintains the PFIB inventory below the reportable quantity (one pound) there would be no impact to the public.

WASTE STORAGE TANKS

- TA3-154

  This structure was identified as a site-specific vulnerability during the Chemical Safety Vulnerability Review. This structure contains four tanks; 2 concrete tanks of approx. 5,000 gallon capacity, and 2 stainless steel tanks of approx. 1,200 gallon capacity.

  The two concrete tanks are full, one stainless steel tank is full, and the remaining stainless steel tank is about half full. All four tanks have been fully characterized as presenting only a low level radiation hazard. The contents are predominantly water, and there is no explosion, flammable, or chemical hazard. Plans have been drawn up for disposal of the tank contents, but funding and a schedule have not been identified.

- TA21-257

  Work plans have been drawn up and are available to the public in the local Reading Room. The assessment is that this facility poses no concern.

5.0 REFERENCES

- Secretary Frederico Peña's memorandum, 4 August 1997.
- DOE Order 440.1, "Worker Protection Management for DOE Federal and Contractor Employees."
- DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies."
- DOE Order 151.1, "Comprehensive Emergency Management System."
- "Definitions and Criteria for Accident Analysis," DOE-DP-3005-93.
- DOE Handbook "Process Safety Management for Highly Hazardous Chemicals," Section 3.2. DOE HDBK-1101-96, February 1996.
- DOE Handbook "Chemical Process Hazard Analysis," DOE HDBK-1100-96.
- Title 40 Code of Federal Regulations Part 68, "Accidental Release Prevention Requirements: Risk Management Programs ...."
- Title 29 Code of Federal Regulations Part 1910.119, "Process Safety Management of Highly Hazardous Chemicals."
- Fundamentals of Industrial Hygiene, 4th Ed., National Safety Council.
- Threshold Limit Values for Chemical Substances and Physical Agents, American Conference of Governmental Industrial Hygienists (ACGIH®), 1997.
- Industrial Ventilation: A Manual of Recommended Practice, 22nd Ed., American Conference of Governmental Industrial Hygienists.
- Engineering Field Reference Manual, American Industrial Hygiene Association, (AIHA).
- NIOSH Pocket Guide to Chemical Hazards.

6.0 ATTACHMENTS

Attachment 1: [LANL] Notice: Performance of Laboratory Chemical Fume Hoods—Requirements

7.0 CONCLUSIONS / RECOMMENDATIONS

No new chemical or radiological vulnerabilities were identified. Existing vulnerabilities are being adequately addressed. The buildings and storage areas were adequate and protected by physical barriers and security systems.

These recommendations are based on the data that was available at the time of this evaluation and current standards and guidelines. If there are any questions, please contact:

David L. Barber, CIH
Industrial Hygienist
DOE-LAAO
505-667-3818
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505-667-7801
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United States Government

Department of Energy
Grand Junction Office

memorandum

DATE: NOV 25 1997

SUBJECT: DOE/AL Response to the May 14, 1997 Explosion at Hanford's Plutonium Reclamation Facility

TO: AL/OSHD

Attached are actions taken in response to the subject memo for your information. DOE-GJO also conducted H&S Walk-through (Nov. 12 at GJO Site and Monticello during Nov. 6-7) on both FOS and TAR contractors and verified the contractors' responses and actions associated with the subject.

Based on the H&S Walk-throughs and a recent review, DOE-GJO has adequate procedures and these documentation are adequately addressed the corrective action identified by the Secretary of Energy memo, dated Aug. 4, 1997, subject: DOE Response to the May 14, 1997 Explosion at Hanford's Plutonium Reclamation Facility.

If you have any questions, please contact Bo Kim at (970) 248-7620.

Michael K Tucker

Mike Tucker
Team Leader, Technical Support

Attachment (2)

cc:
D. Christenson, OMD

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WASTREN-Grand Junction

2597 B 3/4 Road • Grand Junction, CO 81503
(970) 248-6000 • Fax (970) 248-6040

November 17, 1997
In Reply Refer to: LSH/GJ-026/1197

B. H. Kim
Safety & Health Specialist
U. S. Department of Energy
P. O. Box 2597
Grand Junction, CO 81502

SUBJECT: Contract No. DE-AC13-96GJ87460; "DOE/AL Response to the May 14, 1997 Explosion at Hanford's Plutonium Reclamation Facility." (D3190)

Dear Mr. Kim:

In response to the May 14, 1997, explosion at Hanford's Plutonium Reclamation Facility, the Secretary of the Department of Energy (DOE) directed that several broad initiatives should be implemented at the DOE field offices. The response to these initiatives is a joint effort by the Safety and Health/Radiation Protection and Environmental Compliance groups. Each initiative is described below along with *WASTREN-Grand Junction's (GJ)* action to address them.

1. DOE site contractors must scrutinize their use or storage of any chemicals that have the potential for explosion, fire, or significant toxic release, and must promptly dispose of unneeded chemicals according to safety requirements and environmental regulations. DOE field offices should develop an approval process to assure the disposal or safe and environmentally compliant storage and handling of such chemicals retained.

WASTREN-GJ Safety and Health/Radiation Protection and Environmental Compliance groups provide oversight for the purchase, storage, and use of all chemicals used at the facility. Chemicals are not permitted on the facility unless they have been received as part of the Chemical Tracking System; Material Safety Data Sheets are available for the site personnel for all chemicals on the site. *WASTREN-GJ* provides a tiered approach to self-assessment for the use and storage of chemicals by conducting independent audits, weekly walk-arounds, and informal management observations. The Safety and Health/Radiation Protection organization conducts daily and weekly facility walkdowns to identify potential violations of regulations. In addition, annual and semiannual building inspections are conducted in accordance with the Schedule for Regular H&S Oversight Assessment. Environmental Compliance conducts weekly RCRA and SAA inspections for compliance with applicable regulations. There are three areas considered as "risk areas." These areas are Building 20 (Laboratory Services), Building 42 (Interim Status Hazardous Waste Storage Area), and Building 61A (Hazardous Waste Storage Area). After notification of the Hanford Explosion, these three areas were heavily scrutinized and carefully inspected to review storage and use of the chemicals specific to each area. No significant findings were noted. All other buildings were inspected with no significant findings. A Hazard Communication Program Quality Assurance Audit, in compliance with 29 CFR 1910.1200, was conducted in June 1997 with

three findings noted. The findings, although considered as non-serious, were entered into the commitment tracking system for corrective action. The three findings have been addressed and closed. An Independent RCRA audit was conducted in August 1997. The audit addressed chemical compatibility and storage, ignitability requirements per 40 CFR 265.17, and reactivity of incompatible waste. No significant deficiencies were noted in the audit. Since WASTREN-GJ assumed the Facility Operations Contract (FOS) at the DOE Grand Junction Office (GJO) Facility, the Environmental Compliance organization has made two waste shipments. The shipments contained chemicals that were no longer needed in the existing processes, chemicals that had expired, and waste chemicals.

2. DOE field offices must reassess known vulnerabilities (chemical and radiological) at facilities that have been shutdown, are in standby, are being deactivated, or have otherwise changed their conventional mode of operation in the last several years, and report status to their Program Secretarial Officers and the Assistant Secretary for Environment, Safety and Health within 120 days. Facility operators must evaluate their facilities and operations for new vulnerabilities on a continuing basis.

The buildings at the GJO site have all been assessed for their known vulnerabilities within their current status. No buildings have been shutdown or placed in a standby status. Those buildings scheduled for deactivation (buildings 26, 29, 31A, 33, and 35) have had all chemicals redistributed or placed in appropriate storage in other buildings for proper reuse or disposal. No existing conditions would recreate hazards representative of those that created the Hanford Explosion. The routine building inspections provide a continuing evaluation for vulnerabilities and none have been noted.

3. DOE and contractor field organizations with operational responsibilities must assess the technical competence of their staffs to recognize the full range of hazards presented by the materials in their facilities, act on results, and implement training programs where needed.

WASTREN-GJ maintains a competent staff of personnel who fully recognize the hazards present on the facility and can implement appropriate corrective actions, if necessary. All personnel are required to attend Hazard Communication Training, Environmental Compliance Awareness Training, and Safety and Health/Radiation Protection Awareness Training (updated and required annually). In addition, specific personnel are trained in accordance with 40 CFR 265.16, "Personnel Training," which incorporates hazardous waste management procedures and effective response to emergencies (including, fires and explosions). A monthly Joint Safety Policy Meeting is conducted between DOE and the FOS and TAR Contractors to review the effectiveness of the safety efforts, resolve safety and health problems relating to current operations and provide a forum for planning safe future construction and other activities. Regularly scheduled supervisor safety meetings and weekly "toolbox" or "on-the-job" safety meetings for the employees are required. These trainings provide technical competence for facility personnel to recognize noncompliant activities and conditions and provide immediate corrective actions to prevent conditions that might create a condition that existed before the Hanford Explosion.

4. DOE field offices must assess their site Lessons Learned and Occurrence Reporting programs to assure that 1) outgoing information is well characterized and properly summarized, and 2) incoming information is thoroughly evaluated, properly disseminated, appropriately implemented and tracked through formal management systems.

The Quality Assurance (QA) group serves as the coordinator for the dissemination of lessons learned for the GJO, as described in the *Quality Assurance Standards* QAI 3.3, "Dissemination of Lessons Learned." Incoming information on lessons learned from the DOE community is distributed to *WASTREN-GJ* and MACTEC-ERS managers. Each manager reviews the lessons for applicability within their areas of responsibility and distributes the information within the organization with a routing slip. Managers and investigation leaders identify internal lessons learned through investigations, self-assessment, and post-activity evaluations. Lessons learned reports are developed and distributed throughout the DOE-GJO facility. When the lessons learned may be beneficial to others, the Occurrence Reporting and Processing System (ORPS) is used to distribute the information. All Occurrence Reports originated at the GJO facility are formulated as a cooperative effort between the responsible organization, Safety and Health/Radiation Protection Group, and the DOE Health and Safety Specialist.

This letter serves as the final report and meets the requirement for the report for DOE Tracking Number D3190.

If you have any questions concerning the response to the commitment tracking request, please call Gary Thigpin at extension 7662.

Sincerely,

Linda S. Hendrickson
Compliance Management Manager

bas/LSH

cc: J. T. Bennett, *WASTREN-GJ*
T. K. Campbell, *WASTREN-GJ*
J. W. Gardner, *WASTREN-GJ*
L. S. Hendrickson, *WASTREN-GJ*
R. L. Morris, *WASTREN-GJ*
M. K. Orn, *WASTREN-GJ*
J. F. Sink, DOE-GJO
G. P. Thigpin, *WASTREN-GJ*
C. A. File
To File

mactec-ers
MACTEC ENVIRONMENTAL RESTORATION SERVICES, LLC

NOV 2 1 1997

CONTRACT NO.: DE-AC13-96GJ87335
TASK ORDER NO.: MAC96-11-03
CONTROL NO.: 3100-T98-0280

November 20, 1997

Safety and Health Specialist
Department of Energy
Grand Junction Office
2597 B¾ Road
Grand Junction, Colorado 81503
ATTN: Mr. Bo H. Kim

Subject: Contract No. DE-AC13-96GJ87335—DOE/AL Response to the May 14, 1997 Explosion at Hanford's Plutonium Reclamation Facility - D3191

Reference:
1. Memorandum, Federico Pena to Program Secretarial Officers/Field Element Managers, dated August 4, 1997, DOE Response to the May 14, 1997 Explosion at Hanford's Plutonium Reclamation Facility
2. Memorandum, Gene E. Runkle to W. Steven Goodrum, et al, dated August 14, 1997, same subject
3. Memorandum, Larry D. Kirkman to W. S. Goodrum, et al, dated September 22, 1997, same subject

Dear Mr. Kim:

In reference 1, Secretary Federico Pena requested that each site contractor implement four broad initiatives and report on the progress at the end of the year. Reference 2 requested that the report addressing the identified initiatives be forwarded to the Occupational Safety and Health Division (OSHD) by December 12, 1997. Reference 3 changed that due date to November 26, 1997.

Each initiative is described below and MACTEC-ERS's action to address it.

1. DOE site contractors must scrutinize their use or storage of any chemicals that have the potential for explosion, fire, or significant toxic release, and must promptly dispose of unneeded chemicals in accordance with safety requirements and environmental regulations. DOE field offices should develop an approval process to assure the disposal or safe and environmentally compliant storage and handling of such chemicals that are retained.

   Action: MACTEC-ERS and its subcontractors have few chemicals that have any potential for explosion, fire, or significant toxic release. The largest quantities of chemicals are associated with the Monticello Remedial Action Project Waste Water Treatment Plant. The hazards and

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operating procedures associated with the WWTP are addressed in the *Monticello Projects Health and Safety Plan* (MAC-MRAP 1.3.4) and the *Monticello Remedial Action Project Wastewater Treatment Plant Operations and Maintenance Manual, Volumes 1, 2, and 3.*

2. DOE field offices must reassess known vulnerabilities (chemical and radiological) at facilities that have been shutdown, are in standby, are being deactivated, or have otherwise changed their conventional mode of operation in the last several years, and report status to their Program Secretarial Officers and the Assistant Secretary for Environment, Safety and Health within 120 days. Facility operators must evaluate their facilities and operations for new vulnerabilities on a continuing basis.

   Action: MACTEC-ERS has no facilities which have been shutdown, are in standby, are being deactivated, or have otherwise changed their conventional mode of operation in the last several years. The Monticello Remedial Action Project is an ongoing remediation program with full-time safety support for identifying vulnerabilities on a continuing basis.

3. DOE and contractor field organizations with operational responsibilities must assess the technical competence of their staffs to recognize the full range of hazards presented by the materials in their facilities, act on results, and implement training programs where needed.

   Action: MACTEC-ERS and its subcontractors maintain competent staffs of personnel who fully recognize the hazards present in the work they perform. Worker qualifications and training for the Monticello Remedial Action Project are strictly maintained in accordance with 29 CFR 1910.120.

4. DOE field offices must assess their site Lessons Learned and Occurrence Reporting programs to assure that 1) outgoing information is well characterized and properly summarized, and 2) incoming information is thoroughly evaluated, properly disseminated, appropriately implemented, and tracked through formal management systems.

   Action: The Lessons Learned program is described in Manual GJO 1, *Grand Junction Office Quality Assurance Manual*, QAI 3.3, *Dissemination of Lessons Learned.* Incoming information on lessons learned is distributed to managers, who review the lessons for applicability within their areas of responsibility, and distribute the information within their organization as needed. The Occurrence Reporting program is described in Chapter 4 of Manual GJO 2, *Grand Junction Office Health and Safety Standards.* It requires that management determine and document the significance, nature, and extent of events or conditions, as well as the causes, corrective actions, and lessons learned. It further requires the use of information from contractor occurrences and occurrences from other sites to prevent future occurrences.

No additional action on these items are expected. If you have any questions, please call me at extension 6468 or Don White at extension 6432.

Sincerely,

Michael R. Hurshman
Health and Safety Manager

/dew
cc: M. C. Butherus
D. L. Quamme
G. P. Thigpin
D. E. White
Contract File (C. Spor)
HS 2.1.1.4